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## Hans Selye: The Original and Creative Scientist<sup>a</sup>

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Between 1968 and 1971, I had the pleasure and privilege to work with Professor Hans Selye at the Institute of Experimental Medicine and Surgery, Université de Montréal, Montréal, Québec, Canada.

Before 1968, I traveled several times to various European countries. I spent two years in England and received the Ph.D. degree from the University of Liverpool, Liverpool, United Kingdom. I was very fortunate because I worked with Professor H. L. Sheehan, an excellent scientist and teacher, one of the giants in pituitary pathology. My trip to Montréal was my first to North America. I was very excited when Dr. Selye invited me to work with him in his internationally recognized institute. First, I was a visiting scientist, and after a short period of time I was appointed to be a member of the professional staff. I was fully devoted to and deeply involved in research. We worked from early morning to late evening, even the weekends were used for experiments, microscopic investigation, discussions, reading, writing, and last but not least for thinking and planning experiments that would prove or disprove our hypotheses. We worked on experimental production of myocardial necrosis in rats, calciphylaxis, microsomal enzyme induction in the liver, catatoxic steroids, dimethyl-benzanthracene-induced breast tumors, aniline-induced adrenocortical lesions, toxic effects of various drugs, the prevention of tissue damage, and many other subjects. It was an exciting and stimulating time for me. I had the opportunity to discuss hypotheses, experimental plans, and results with Dr. Selye. I have learned very much from his life philosophy and admired his devotion to research. I felt, as Newton once said, that I was standing on the shoulders of a giant.

Dr. Selye was an original and creative scientist with a colorful and stimulating personality. He was a superb observer with an excellent memory, a critical mind, and an uncompromising devotion to research. He loved to plan and perform experiments. He considered himself a general practitioner of experimental medicine. He disliked modern methods and thought that major problems could be solved with autopsy and gross inspection alone. He performed the autopsies of rats himself and made several original and important discoveries at the autopsy table. He was a problem finder more than a problem solver. He jumped from one subject to another and often changed his research area. He was a highly intelligent man with extensive knowledge and original ideas.

In my view, creativity was a very important characteristic of Dr. Selye. What is creativity? Because I am an academic pathologist, I will discuss creativity and its importance in relation to pathology.

The word "creativity" comes from the Latin "creatus" which means the ability to create. According to the definition of Webster's Medical Dictionary, creativity is the process of making or bringing into being. As a result of the creative impulse,

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something comes into being that did not exist before. Creativity is the discovery of previously unknown facts; it requires involvement, intensity, and courage. New insights and novel theories often arise suddenly from the unconscious, and the new ideas may upset concepts that were apparently satisfactorily worked out before. Thus, creators are usually rebels who fight against well-established and generally accepted dogmas and contemporary beliefs.

Creativity is important in life, art, technology, and last but not least in science. To bring something into existence, to produce something for the first time through imagination gives joy and satisfaction to the creative scientist.

It is difficult to answer the question: What is the role of creativity in pathology? First, we have to explain what pathology is and what pathologists are doing. After discussing these two questions, we can focus on the importance of creativity in pathology.

Pathology is the basis of medicine. It investigates disease processes primarily using morphologic techniques. The study of abnormal structural features, however, is not adequate alone; one has to correlate the morphologic findings with functional activity. Pathology is one of the most stimulating and exciting disciplines of medicine. It not only describes various abnormalities, but also it tries to understand the mechanisms of disease; it attempts to shed light on the causation of various lesions occurring in human and animal organisms.

Pathologists spend their lives either in university-affiliated teaching hospitals or in community hospitals or in various research laboratories or in the pharmaceutical industry. In the pathology department of the teaching hospital, pathologists have three main responsibilities: service, teaching, and research. In community hospitals, pathologists are engaged in service work only. Research laboratories perform either curiosity-oriented or goal-oriented research. Pathologists employed by the pharmaceutical industry primarily carry out toxicity studies; they test the possible adverse effects of various drugs and compounds.

Service work involves performing autopsies, examining biopsy specimens taken from patients for diagnostic purposes, undertaking cytologic studies, and so forth. Description of morphologic changes found grossly or microscopically does not require creativity. Reporting of findings must be done in an unbiased way; creativity plays no role when one registers the facts. Creativity is not needed in toxicology tests when one describes macroscopic or microscopic lesions due to various chemical compounds or other potentially harmful interventions. However, creativity is important in teaching. Excellent teachers are innovative, imaginative individuals who can stimulate students. The role of creativity in teaching will not be discussed here because it has a more general relevance and is not limited exclusively to teaching in pathology.

Creativity is very important in pathology-oriented research. Several excellent scientists were pathologists who knew that the collection of facts without creative impulse does not lead to discoveries. New ideas come from those areas to which the pathologist is most intensely committed. Creativity, in general, is characterized by suddenness, opposition to currently dominating concepts, excitement of the moment, and immediate certainty. Knowledge, devotion, and a critical mind, as well as creativity are necessary characteristics of a successful academic pathologist. There is no doubt that true success in science requires creativity. Scientists know that it is better to light one candle than to curse the darkness.

Academically oriented pathologists need to be creative every day. Planning of decisive experiments cannot be completed often without a creative mind. Creativity is a prerequisite in the formulation of new theories, in the clarification

of unforeseen correlations. For further progress in pathology, we need creative pathologists.

In this International Congress of Stress entitled, "Stress of Life: Stress and Adaptation from Molecules to Man," we are commemorating the 90th birth anniversary of Dr. Selye. His contribution to science was significant. The stress concept was most likely his most important legacy. He was ahead of his time. Studies on stress have expanded during the last two decades and will be an exciting research area in the coming years.

Dr. Selye passed away in 1982. Science has changed considerably during the last two decades. Unprecedented progress was made in the better understanding of cell structure and function under normal and abnormal conditions. We know much more about the mechanisms of different diseases. Novel methods, new diagnostic tests, drugs, and treatments have been discovered; and substantial advances were made in physiology, pharmacology, immunology, surgery, and pathology. Molecular biology and pathology emerged as new disciplines. We can now investigate genes, receptors, growth factors, and oncogenes. We have a deeper insight into the cell cycle, cell division, tumorigenesis, endocrine regulation, and pathogenesis of several diseases. Despite substantial progress, Dr. Selye's works are still stimulating today. He loved and appreciated original ideas, and there is no doubt in my mind that new ideas can revolutionize pathology and other disciplines of medicine. He was an enthusiastic leader. I fully agree with Emerson: "Nothing great was ever achieved without enthusiasm."